Market Price Monitor

Local Equity Markets

- European equity market returns declined at the start of September on the back of trade tensions, but gradually recovered over the month.
- Both the Euro Stoxx 50 and FTSE 100 indices ended the month higher. The FTSE 100 has turned positive for the year, but the Euro Stoxx remained negative.

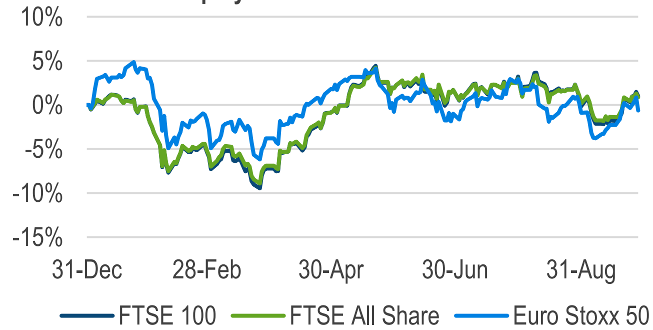
Global Equity Markets

- The US equity market continues upward, being up by 11% year-to-date. In contrast, the Emerging Markets index dropped even lower this month, down by 8% year-to-date.
- Japanese market was one of the best performers in September, gaining a healthy return of more than 5% and turning the market's year-to-date performance positive.

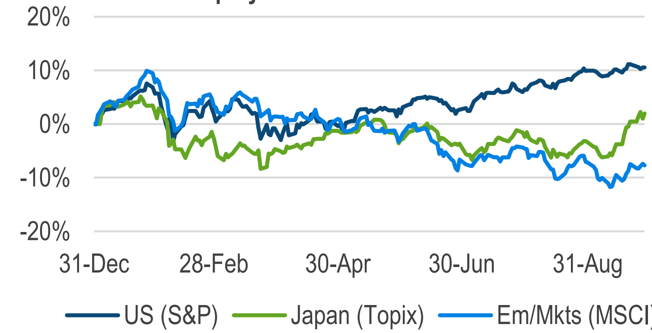
Bond/FX Markets

- Global and Sterling corporate bonds declined in September.
- UK government bonds declined by more than 1.5% during the month.
- The British Pound rebounded against other major currencies in September, but remains negative against others year-to-date.

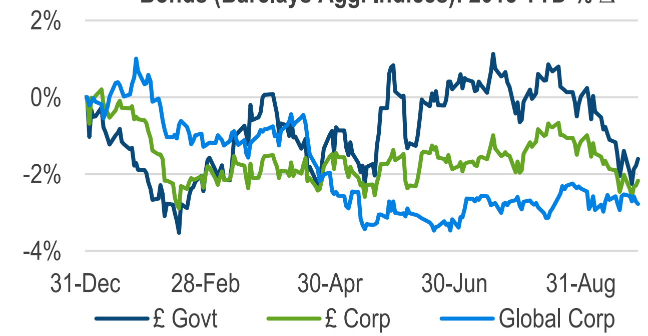
Local Equity Markets: 2018 YTD Total Return %



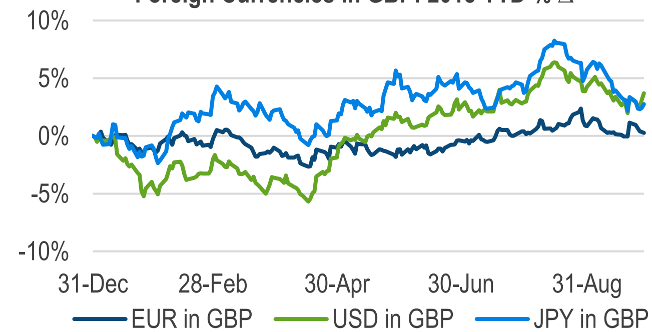
Global Equity Markets: 2018 YTD Total Return %



Bonds (Barclays Agg. Indices): 2018 YTD % Δ



Foreign Currencies in GBP: 2018 YTD % Δ



Total Returns as of September 28, 2018

	FTSE 100	FTSE All Share	Euro Stoxx 50	US (S&P)	Japan (Topix)	Em/Mkts (MSCI)	£ Govt	£ Corp	Global Corp	EUR in GBP	USD in GBP	JPY in GBP
1 Month	1.2%	0.7%	0.3%	0.6%	5.5%	-0.5%	-1.6%	-1.0%	-0.4%	-0.6%	-0.5%	-2.8%
3 Month	-0.7%	-0.8%	0.4%	7.7%	5.9%	-1.1%	-1.8%	-0.3%	0.4%	0.6%	1.4%	-1.3%
1 Year	6.1%	5.9%	-2.9%	17.9%	10.8%	-0.8%	0.6%	0.0%	-1.4%	0.9%	2.8%	1.8%
YTD	1.0%	0.9%	-0.6%	10.6%	2.0%	-7.7%	-1.6%	-2.2%	-2.8%	0.3%	3.7%	2.8%

Milliman Financial Risk Management
London Market Monitor – 28 September 2018

Data sources: Bloomberg; Barclays; EIOPA; Oxford-Man Institute; ONS; Milliman FRM

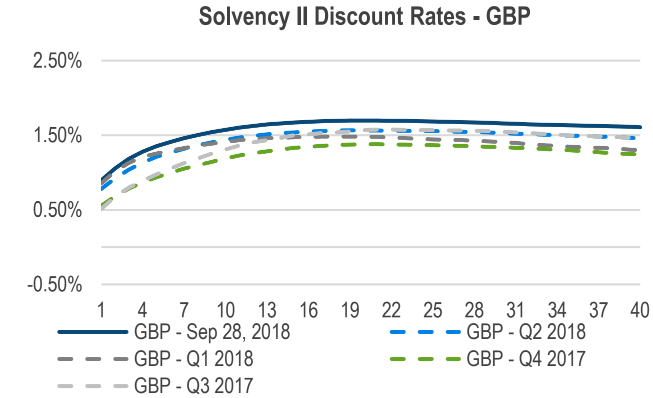
Solvency II Monitor - Rates

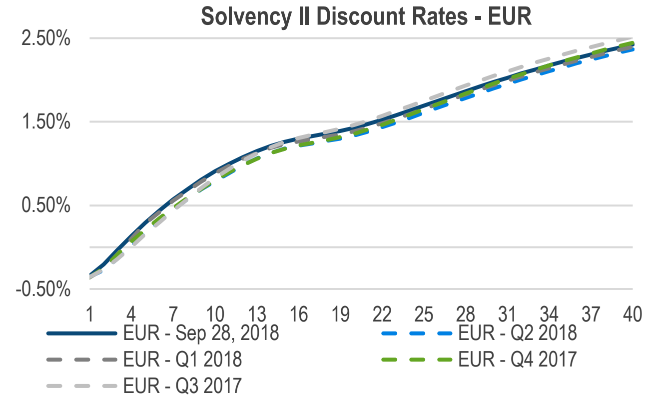
Risk Free Rates

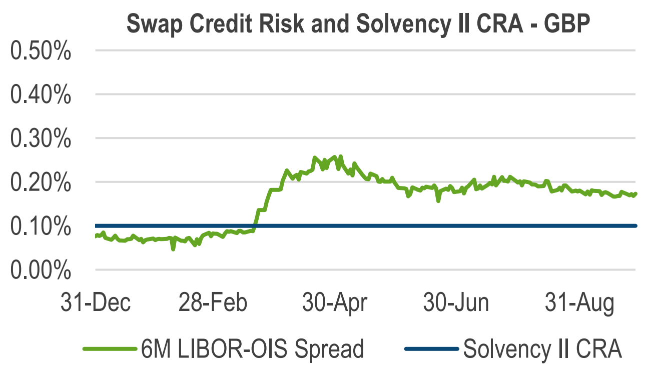
- For GBP, there were increases in all terms on the curve during September, with terms between 10 and 20 years up 12 basis points.
- There were similar movements for the EUR curve, with terms between 5 and 10 years being up 12 basis points.

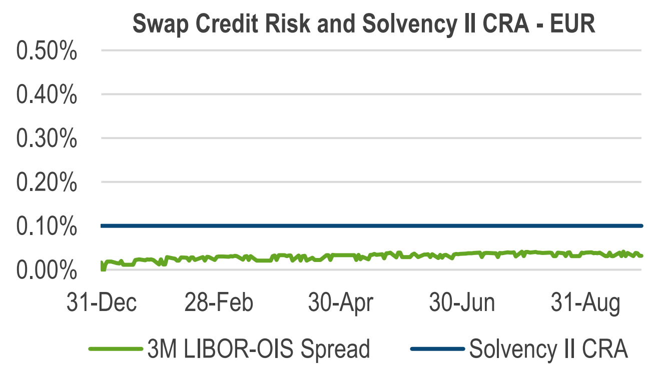
Credit Risk Adjustment

- GBP LIBOR-OIS spread continues to be above the CRA 10 basis point. However, this has still yet to lead to a rise in CRA above the minimum 10 basis point floor. This is because the CRA is based upon a historical average of the LIBOR-OIS spread over a 1-year period.
- EUR LIBOR-OIS continues to remain below the 10 basis point floor.









Change in GBP Discount and CRA (bps)

	1Y	Y5	Y10	Y20	Y30	CRA
Since Q2 2018	12	14	14	13	13	0
Since Q1 2018	4	10	16	22	25	0
Since Q4 2017	34	42	39	32	32	0
Since Q3 2017	38	38	26	13	11	-3

Change in EUR Discount and CRA (bps)

	1Y	Y5	Y10	Y20	Y30	CRA
Since Q2 2018	1	13	12	9	8	0
Since Q1 2018	2	1	2	4	4	0
Since Q4 2017	2	8	11	7	2	0
Since Q3 2017	1	14	8	-4	-7	0

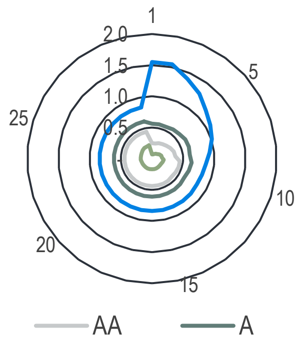
Solvency II Monitor - Spreads

Fundamental Spreads

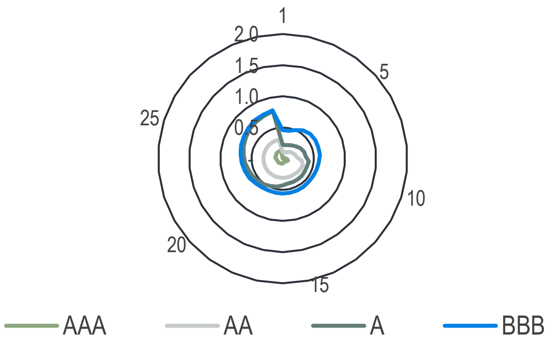
- The fundamental spread data shown is for end of August.
- There were no material changes compared to the end of July.

Fundamental Spreads %

GBP - Financial



GBP - Non-Financial



GBP Financial Fundamental Spread %

	1Y	Y5	Y10	Y20	Y30
AAA	0.07	0.11	0.18	0.17	0.22
AA	0.25	0.31	0.45	0.44	0.44
A	0.56	0.59	0.62	0.61	0.61
BBB	1.55	1.16	0.84	0.84	0.84

GBP Financial 'Before Floor' %

	1Y	*Y5*	*Y10*	*Y20*	*Y30*
AAA	*0.00*	*0.04*	*0.08*	*0.15*	*0.22*
AA	*0.04*	*0.07*	*0.11*	*0.19*	*0.27*
A	*0.07*	*0.14*	*0.22*	*0.36*	*0.49*
BBB	*0.17*	*0.28*	*0.39*	*0.57*	*0.69*

GBP Non-Financial Fundamental Spread %

	1Y	Y5	Y10	Y20	Y30
AAA	0.00	0.02	0.09	0.09	0.14
AA	0.11	0.16	0.34	0.31	0.31
A	0.22	0.29	0.41	0.53	0.78
BBB	0.46	0.59	0.57	0.59	0.79

GBP Non-Financial 'Before Floor' %

	1Y	*Y5*	*Y10*	*Y20*	*Y30*
AAA	*0.00*	*0.02*	*0.04*	*0.09*	*0.14*
AA	*0.00*	*0.04*	*0.09*	*0.19*	*0.27*
A	*0.04*	*0.15*	*0.28*	*0.53*	*0.78*
BBB	*0.11*	*0.23*	*0.36*	*0.59*	*0.79*

The **Solvency II risk-free discount rates** are based on applying the Smith-Wilson Extrapolation to LIBOR swap rates sourced from Bloomberg (current curve is for 28/09/18) and applying the Credit Risk Adjustment as defined in the Technical Specs.

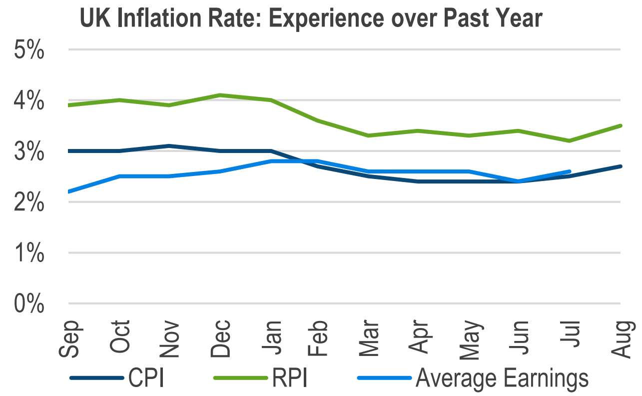
The **Credit Risk Adjustment** is a component of the risk-free discount curve defined by EIOPA. It is calculated from actual experience in the 'LIBOR-OIS' spread (3 months for EUR, 6 months for GBP), and is bounded between 0.10 and 0.35. We show actual LIBOR-OIS spread levels and the defined CRA, for both GBP and EUR.

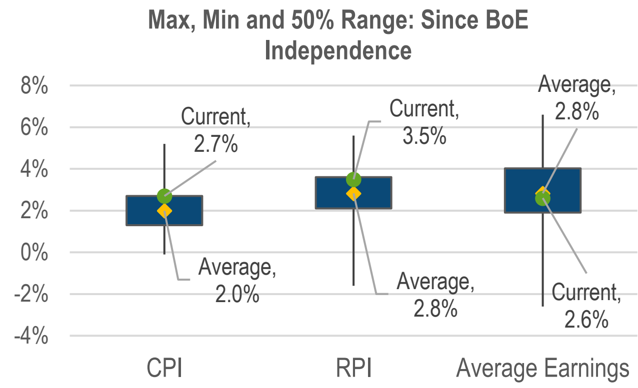
EIOPA fundamental spreads show the credit spread corresponding to the risk of default or downgrading of an asset. This is shown here across financial and non-financial assets, credit quality steps 0-3 and durations of 1-30 years. The data is provided by EIOPA and as of 31/08/18. **Fundamental spread** = maximum (probability of default + cost of downgrade; 35% of long-term average spread). In the tables we show the '**before floor'** measure = probability of default + cost of downgrade.

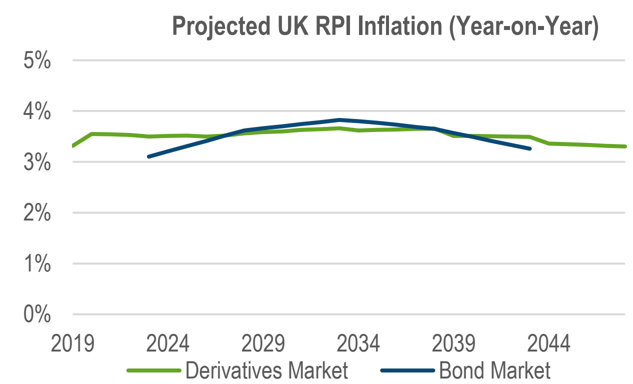
Data sources: Bloomberg; Barclays; EIOPA; Oxford-Man Institute; ONS; Milliman FRM

UK Inflation Monitor

- CPI price inflation rose from 2.5% to 2.7% in August, and RPI price inflation also increased by 30 basis points to 3.5% in the same month. Both rates rebounded from their lowest levels for the past 12 months.
- The earnings inflation in July was 2.6%, a slight increase from June.
- According to the ONS: *Rising prices for a range of recreational and cultural goods and services, transport services and clothing produced the largest upward contributions to the change in the rate between July and August 2018. Partially offsetting downward contributions came from furniture and household goods, and telecommunications…*
- The market implied view of future inflation shows little change since July. The derivatives market implies an RPI inflation rate of 3% for very short terms, rising to higher levels in future years.







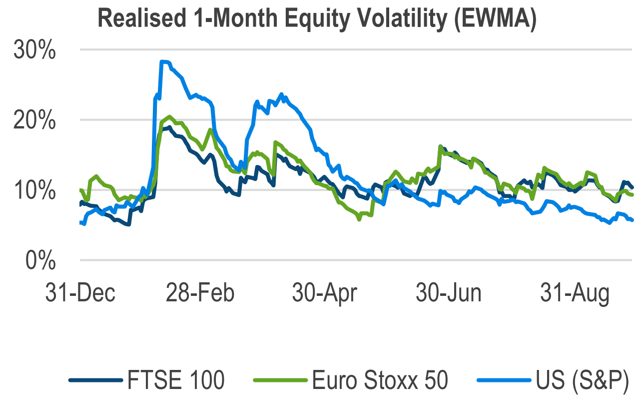
Historical year-on-year inflation rate is assessed by the % change on:
- **Consumer Price Index (CPI)** – measuring the monthly price of a basket of consumer goods and services
- **Retail Price Index (RPI)** – similar to CPI, but the main difference due the addition of mortgage payments, council tax and other housing costs
- **Average Earnings** – measuring the average total weekly employee remuneration over the previous 3 months.

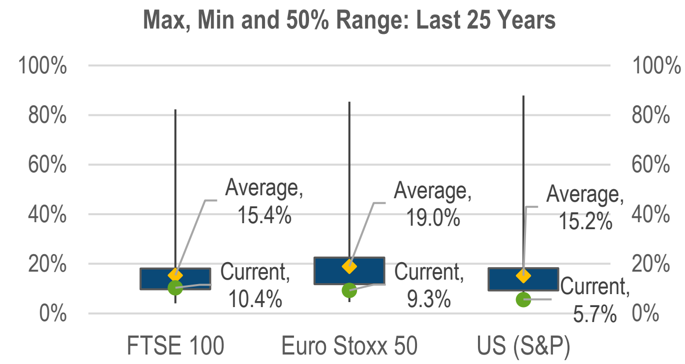
Projection year-on-year inflation rate is the forward rate calculated from market data:
- **Derivatives Market View** – constructed from zero coupon inflation par swap rates against the RPI index at various tenors
- **Bond Market View** – constructed from the difference between the nominal rates implied by the conventional gilts and the real rates implied by the index-linked (RPI) gilts.

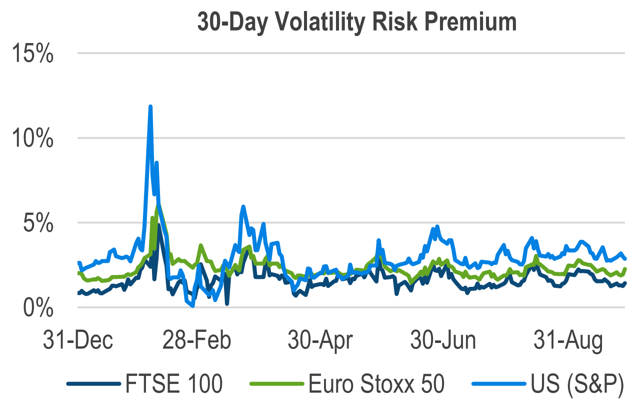
Data sources: Bloomberg; Barclays; EIOPA; Oxford-Man Institute; ONS; Milliman FRM

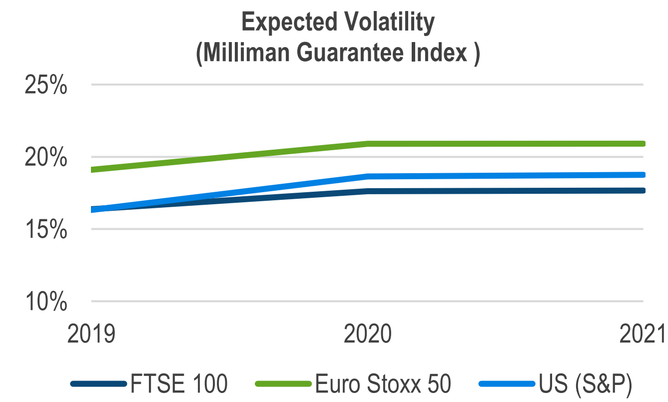
Volatility and Hedging Cost Monitor

- Realised volatility of European equity indices briefly increased at the start of the month, but declined in the remaining month to below 10%. US equity volatility declined further in September to just above 5%.
- The volatility risk premium declined slightly for all indices in September, with the S&P 500 index ending the month around 3.0%.









Actual realised equity volatility is measured by the weighted standard deviation of 1 month daily index change. The Exponentially Weighted Moving Average (EWMA) methodology places more importance to the recent returns in the calculation of the volatility.

Volatility Risk Premium is estimated as the difference between 30-day implied volatility and projected realised volatility (on data from the Oxford-Man Institute). This reflects the additional cost of hedging from purchasing a basket of options, in comparison to managing a dynamic delta hedge with futures (ignoring rolling transaction costs).

Expected realised volatility is an intermediate result from the Milliman Guarantee Index™ (MGI), which provides volatility parameters for variable annuity guarantee (VA) valuation and risk management. The levels shown are on an expected basis, and do not reflect any risk adjustment.